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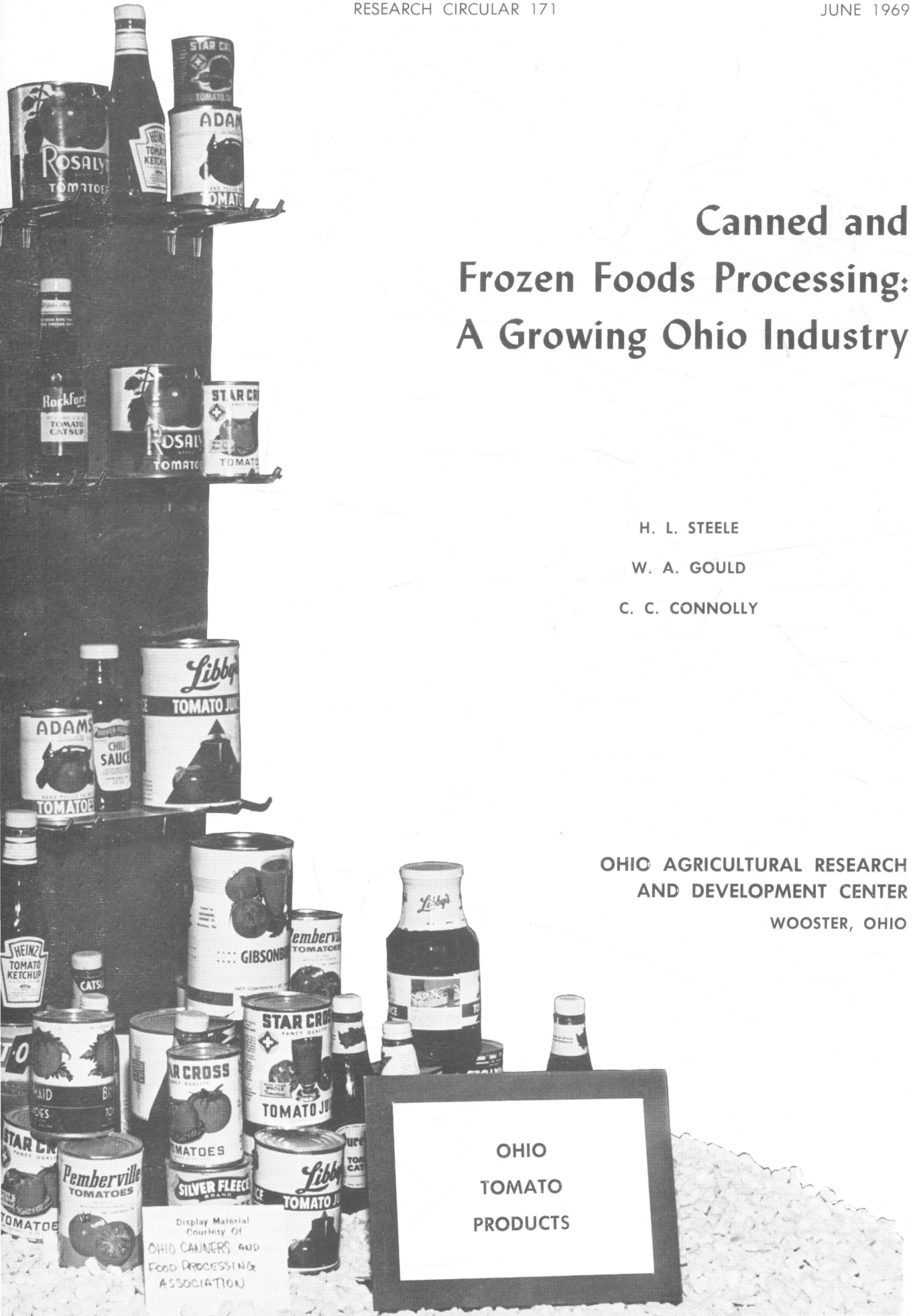

Canned and Frozen Foods Processing: A Growing Ohio Industry

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Canned and Frozen Foods Processing: A Growing Ohio Industry

H. L. STEELE, W. A. GOULD, and C. C. CONNOLLY[1]

INTRODUCTION

Americans enjoy a selection of high quality food products in a variety of finished forms unsurpassed anywhere in the world. This nation's food production, processing, and distribution systems, working through a viable market mechanism, have made it possible for the typical American consumer to obtain this unusual variety of high quality food products for an expenditure of about 18 percent of the family's total personal disposable income—the smallest share of income allocated to food products anywhere in the world.

The American food production, processing, and marketing industries have characteristically been innovative, competitive, and dynamic. These industries have experienced growth problems at times and have not always operated with a minimum waste of resources. However, they also have encouraged research and development activities out of which innovations, both technical and economic, were born and adopted.

These industries have catered to consumers' changing needs and wants, brought about largely by continued urbanization and changes in American family patterns of living, by transferring food preparation and kitchen drudgery to the factory. Not only does the typical American homemaker have at her disposal a wide variety of foods, but many added services are built in for her convenience. Thus, the total food expenditure includes additional utilities since the finished products are pre-cooked, pre-mixed, pre-packaged, fortified, pre-portioned, or in other ways "pre-prepared" for the family's benefit.

The objectives of this publication are:

1. To point out changes taking place in the processing of food and kindred products in the United States and Ohio as measured by changes in value added by manufacture, number of establishments, number of employees, and payrolls.
2. To compare growth of the canned and frozen foods processing industry segment with that of all food and kindred products.
3. To present per capita consumption, estimated total consumption, farm production, and estimated net farm income possibility data for the cucumber and tomato industries, by regions, which partially explain recent growth patterns in canned and frozen foods processing.
4. To outline several problem areas within the canned and frozen foods industry requiring the cooperative attention of farmers, agribusiness, government, and research scientists.

VALUE ADDED BY MANUFACTURE

One indicator of the extent to which services are being added to raw agricultural products in the marketing system before they are "ready for consumers" is the change in value added for food and kindred products.[2] This is computed by the U. S. Department of Commerce from data obtained during the Census of Manufacturers every 5 years. In effect, it is a measure of the difference between the value of final goods shipped by manufacturers and the original cost of the raw products in those goods.[3]

The data in Table 1 show that value added by manufacturers for all food and kindred products in the United States increased 58.5 percent between 1954 and 1963, from nearly $13.8 billion to slightly more than $21.8 billion. The situation in Ohio was quite similar. Value added for all food and kindred products increased 52.6 percent for the same period, from $689,357,000 to $1,051,910,000. The values change slightly when the 1958 and 1963 data are deflated by changes in the general level of wholesale prices, using 1954 as a base, but the relative relationships remain the same. In terms of real dollars (purchasing power), Ohio value added by manufacturing increased 41.3 percent while that for the United States increased 46.8 percent.

Conversely, the value of the raw product inputs from agriculture used to process the final food prod-

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[2]By census definition, food and kindred products include all meat, dairy, canned and frozen food, grain mill, bakery, beverage, and miscellaneous products.

[3]Value added by manufacture is derived by subtracting the total cost of materials (including materials, supplies, fuel, electric energy, cost of resales and miscellaneous receipts) from the value of shipments (including resales) and other receipts and adjusting the resulting amount by the net change in finished products and work-in-process inventories between the beginning and end of the year. Source: 1963 Census of Manufacturers, General Summary. U. S. Dept. of Commerce, Bur. of Census, Bull. MC 63 (1) -1, p. 22.

TABLE 1.—Value Added by Manufacture, Food and Kindred Products, Ohio and the United States, 1954, 1958, and 1963.*

	1954	1958	Change 1954-58	1963	Change 1954-63
	Million Dollars	Million Dollars	Percent	Million Dollars	Percent
Ohio (Current Dollars)	689.4	871.6	+26.4	1,051.9	+52.6
Ohio (1954 Dollars)†	689.4	806.3	+17.0	974.0	+41.3
United States (Current Dollars)	13,767.0	17,532.6	+27.4	21,825.5	+58.5
United States (1954 Dollars)†	13,767.0	16,218.8	+17.8	20,208.8	+46.8

*Sources: Census of Manufactures, Ohio. U. S. Dept. of Commerce, Bur. of Census, Area Statistics Bulls. MC-134, 1954; MC 58 (3)-34, 1958, and MC 63 (3)-36, 1963, Table 5; Census of Manufactures, United States General Summary. U. S. Dept. of Commerce, Bur. of Census, MC 58 (1)-1, 1958, and MC 63 (1)-1, 1963, Table 3.

†Deflated by wholesale price index for all commodities, 1954 = 100.

ucts remained fairly constant. The indicators used here are total cash receipts from farm marketings for Ohio and the United States, shown in Table 2. In both instances, the increase in value was approximately 0.1 percent over the period or 1.3 percent when adjusted for change in all farm prices, using 1954 as a base year.

Growth in value added by manufacturers of food and kindred products as deflated by an index of changes in the general wholesale price level is an indicator of the added services performed by those firms for consumers (especially when the real value of agricultural raw products is fairly constant). However, it excludes utilities or satisfactions added for some wholesaling functions and all retailing functions performed after the products leave food manufacturers' establishments. Siginificant changes, similar to those described above, are also occurring in these marketing sectors for food but will not be discussed in this report.

A final point relating to value added increases is that these represent added utility to consumers and not simply pure profits to owners of resources. The latter can only be the case in the absence of effective competition in an industry, a situation which does not exist in the American food processing industry. After 2 years of detailed research, the National Commission on Food Marketing reported to the American public that the profits, after income taxes, of American food processors averaged 2.7 cents per dollar of sales in 1964.[4]

CANNED AND FROZEN FOODS SITUATION

Ohio's canned and frozen foods industry grew very rapidly during the 10-year period ending in 1964. This conclusion is based on a comparison between growth of Ohio's industry and the national industry during the same period and considers three factors: change in value added by manufacture, change in number of employees in the industry, and change in payrolls in the industry.

An analysis of the data in Table 3 shows that the canned and frozen foods processing industry has grown more rapidly than the total food processing

[4]This represented a return of 11.3 cents per dollar of owners' equity or net worth in those establishments. Source: Food from Farmer to Consumer, Report of the National Commission on Food Marketing, U. S. Government Printing Office, Washington, D. C., June, 1966, Table 5.

TABLE 2.—Total Cash Receipts from Farm Marketings, Ohio and the United States, 1954, 1958, and 1963.*

	1954	1958	Change 1954-58	1963	Change 1954-63
	Million Dollars	Million Dollars	Percent	Million Dollars	Percent
Ohio (Current Dollars)	1,058.8	983.6	− 7.1	1,060.1	+0.1
Ohio (1954 Dollars)†	1,058.8	968.1	− 8.6	1,073.0	+1.3
United States (Current Dollars)	36,898.6	33,559.7	− 9.0	36,925.3	+0.1
United States (1954 Dollars)†	36,898.6	33,031.2	−10.5	37,373.8	+1.3

*Sources: Agricultural Statistics, 1955, 1959 and 1964. U. S. Dept. of Agriculture publications, Washington, D.C., Tables 688, 690, 685.

†Deflated by index of all farm prices, 1954 = 100.

TABLE 3.—Value Added by Manufacture, Canned and Frozen Food Processors, Ohio and the United States, 1954, 1958, and 1963.*

	1954	1958	Change 1954-58	1963	Change 1954-63
	Million Dollars	Million Dollars	Percent	Million Dollars	Percent
Ohio (Current Dollars)	25.3	58.1	+129.6	123.9	+389.7
Ohio (1954 Dollars)†	25.3	53.8	+112.6	114.7	+353.4
United States (Current Dollars)	1,374.1	1,895.7	+ 38.0	2,778.8	+102.2
United States (1954 Dollars)†	1,374.1	1,753.7	+ 27.6	2,573.0	+ 87.2

*Sources: Census of Manufactures, Ohio, op. cit.; Census of Manufactures, United States General Summary, op. cit.
†Deflated by wholesale price index for all commodities, 1954 = 100.

industry nationally, as measured by change in value added. Value added by canned and frozen food processors more than doubled in actual dollars over the period, increasing $1.4 billion. In terms of 1954 dollars, this represented a real increase of 87.2 percent.

Referring back to Table 1, the real increase in value added for the total U. S. food processing industry was $6.4 billion or 46.8 percent for the same period. In effect, canned and frozen foods growth accounted for 19 percent of the change in value added by all components of the food processing industry. (See footnote 2, page 3).

Ohio's canned and frozen food processing industry had even more rapid growth. From 1954 to 1963, value added by Ohio processors increased more than 350 percent in real dollars—from slightly more than $25 million to nearly $115 million (Table 3). While the canned and frozen foods processing industry accounted for 19 percent of the growth in value added by all food processors nationwide, Ohio canned and frozen food processors accounted for 31 percent of the growth in value added by all Ohio food processors over the period.

The second indicator of growth in Ohio's canned and frozen foods industry is number of employees employed by processing firms. In 1954, 142 firms in the industry employed 3,983 persons (Table 4). By 1963, the number of firms had decreased to 139 but total employment had increased to 6,358 persons, a 59.6 percent increase. By comparison, the national industry numbered 3,513 firms with 199,238 employees in 1954 and 3,969 firms and 244,824 employees in 1963. This represented an increase of 22.9 percent in all employees for the industry nationwide.

An important point to note from the data in Table 4 is that Ohio, unlike the nation as a whole, experienced a 17 percent decline in the number of canned and frozen foods processing plants between 1954 and 1958. These were principally small volume older canneries with obsolete equipment.[5]

It should also be noted that in terms of value added by manufacture and number of employees, the firms remaining more than offset the activity lost

[5]This conclusion is based on opinions expressed by marketing leaders in interviews with the authors relative to why vegetable canneries closed in selected river valleys in Ohio.

TABLE 4.—Number of Canned and Frozen Food Establishments and Employees, Ohio and the United States, 1954, 1958, and 1964.*

	1954	1958	Change 1954-58	1963	Change 1954-63
	Number	Number	Number	Percent	Percent
Ohio					
Establishments	142	118	−16.9	139	− 2.1
All Employees	3,983	4,973	+24.9	6,358	+59.6
United States					
Establishments	3,513	3,693	+ 0.5	3,969	+13.0
All Employees	199,238	233,323	+17.1	244,824	+22.9

*Sources: Census of Manufactures, Ohio, op. cit.; Census of Manufactures, United States General Summary, op. cit.

TABLE 5.—Total Payroll of Canned and Frozen Food and All Processors, Ohio and the United States, 1954, 1958, and 1963.*

	1954	1958	Change 1954-58	1963	Change 1954-63
	Million Dollars	Million Dollars	Percent	Million Dollars	Percent
Ohio					
Canned and frozen food processors	11.5	17.2	+49.6	28.0	+143.5
All food processors	335.9	410.9	+22.3	423.0	+ 25.9
United States					
Canned and frozen food processors	573.1	741.9	+29.5	959.7	+ 67.5
All food processors	6,200.1	7,553.3	+21.8	8,637.2	+ 39.3

*Sources: Census of Manufactures, Ohio, op. cit.; Census of Manufactures, United States General Summary, op. cit.

from those which closed. Apparently large processors already located in the area and others from outside of Ohio found it advantageous to expand or build canning and freezing facilities in the state during this 10-year period.

The third indicator of growth is the change in canned and frozen food establishments' total payroll during the period. Total payroll for Ohio's industry was $28,014,000 in 1963, an increase of more than $16,500,000 or 143.5 percent over 1954 (Table 5). By contrast, total payroll for all food processing establishments in Ohio increased only 25.9 percent. The comparative data for the United States as a whole show a 67.5 percent increase in total payroll for the canned and frozen foods industry and a 39.3 percent increase in total payroll for all food processors.

The information presented above may be summarized as follows:

1. The value added by manufacturers of all food and kindred products, in terms of 1954 dollars, increased 41 percent in Ohio and 47 percent in the United States between 1954 and 1963, a period of relatively stable prices for farm products.

2. In contrast, value added by manufacture by canned and frozen food processors increased 353 percent in Ohio and 87 percent in the United States during the same period.

3. The rapid growth in Ohio's canned and frozen foods processing industry is further substantiated by employee and total payroll data for the period. Ohio experienced a 60 percent increase in number of employees compared with a 23 percent increase nationally. Ohio payrolls increased 144 percent compared with a 26 percent increase for all states.

INDUSTRY EXAMPLES

Two commodities selected for a more detailed analysis of the type of growth evident in Ohio's canned and frozen foods processing industry are cucumbers for pickles and tomatoes. These commodities represent two rapidly growing components of the canned foods processing industry in Ohio. Other commodities could be selected which would show similar growth trends in frozen processed foods.

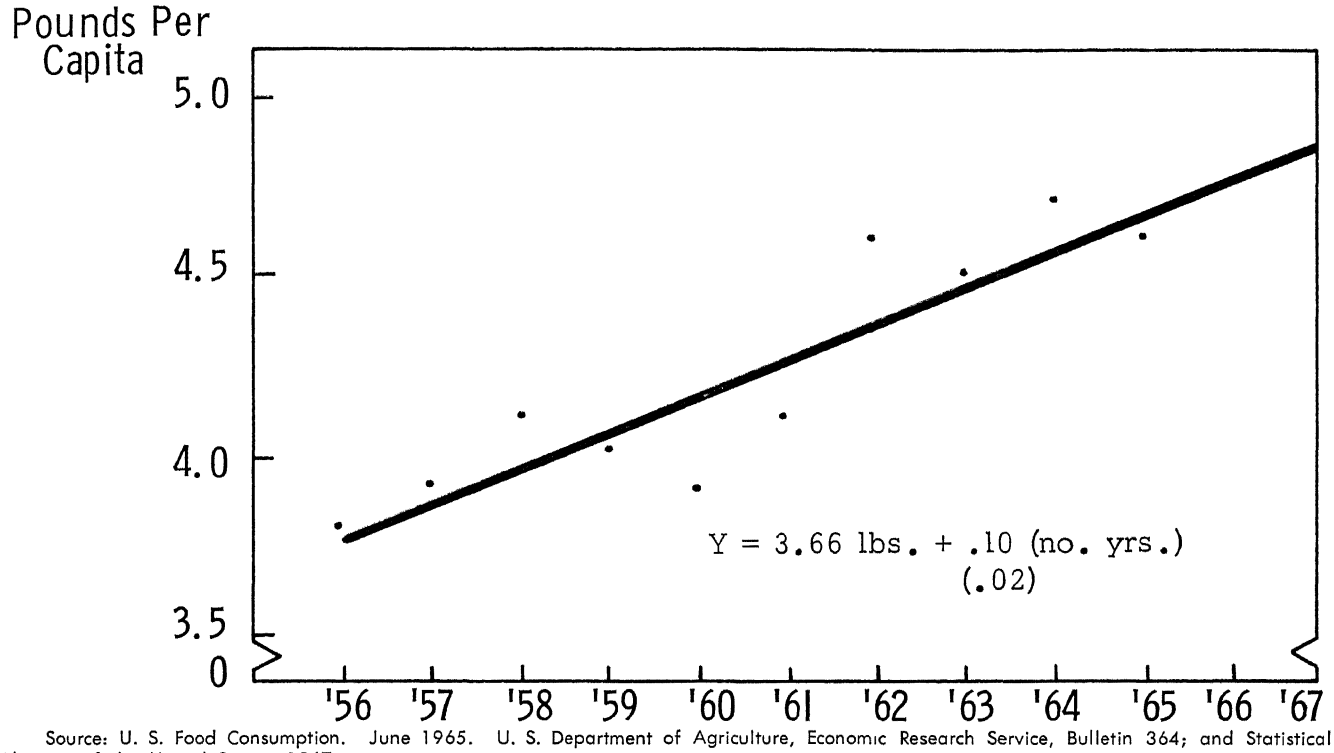
Cucumbers for Pickles

Consumption: A distinct upward trend in both per capita consumption and total consumption of pickles in the United States is seen in the data presented in Figures 1 and 2. The long-term trend in per capita consumption of pickles has been an increasing one since the U. S. Department of Agriculture first published these data in 1919. The growth in per capita consumption of pickles during the past 12 years (0.1 lb. per year) is probably closely correlated with the increasing popularity of eating meals and snacks away from home and the trend toward eating more salads, snacks, and lighter meals at home.

The estimated total U. S. consumption of pickles in 1967 of 486,300 tons (Figure 2) represents an increase of 52 percent during the 12-year period. This significant upward trend in consumption is accounted for by the combined effect of increasing per capita consumption and expanding total population. The current trends in the eating habits of the American public are expected to continue. Consequently, market demand should continue to expand for the pickle processing industry. The estimated market expansion over the 12-year period studied was at an average rate of 15,372 tons per year.

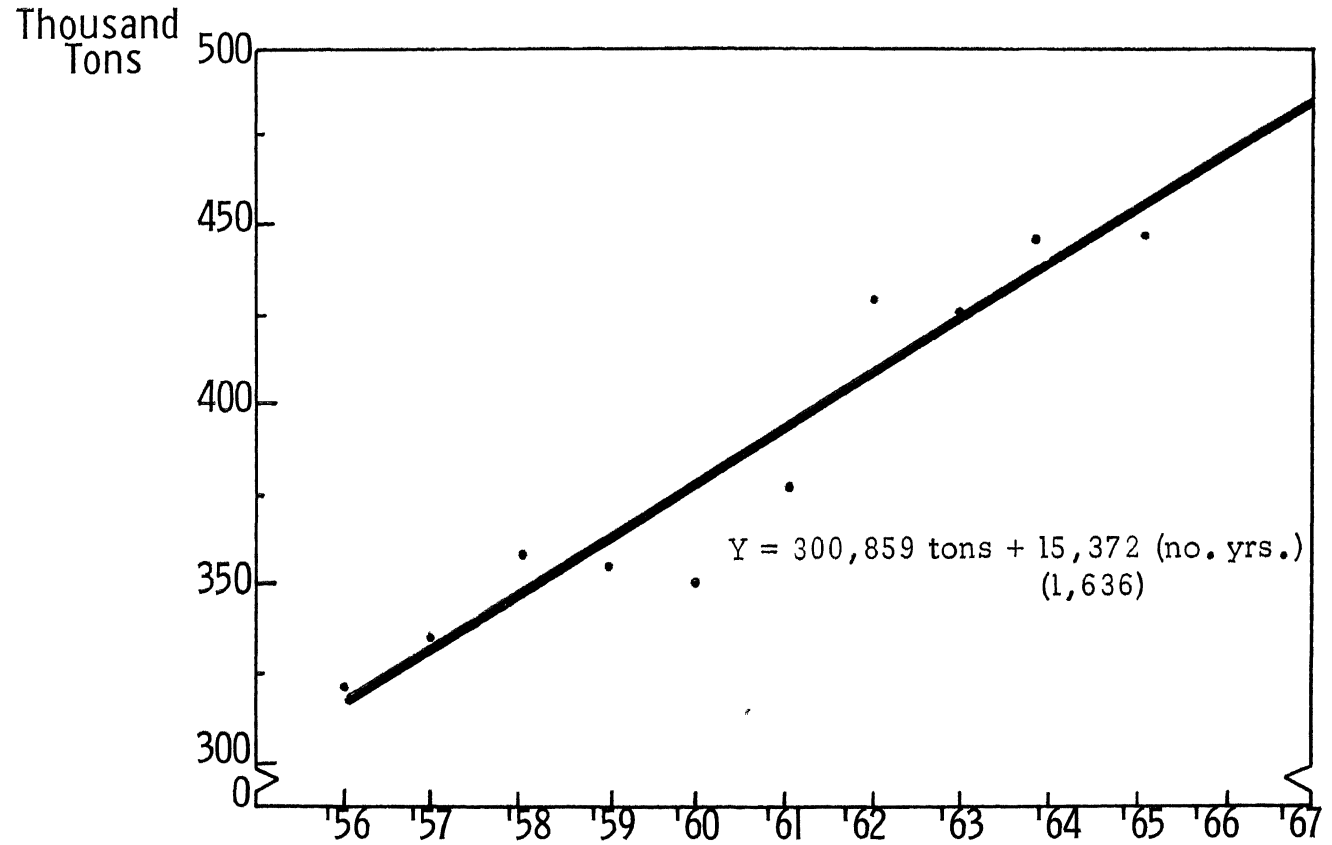
Production: A distinct upward trend in the harvest of cucumbers for pickles is shown in the data

FIG. 1.—U. S. Per Capita Consumption of Pickles, Product Weight Basis, 1956-1967.



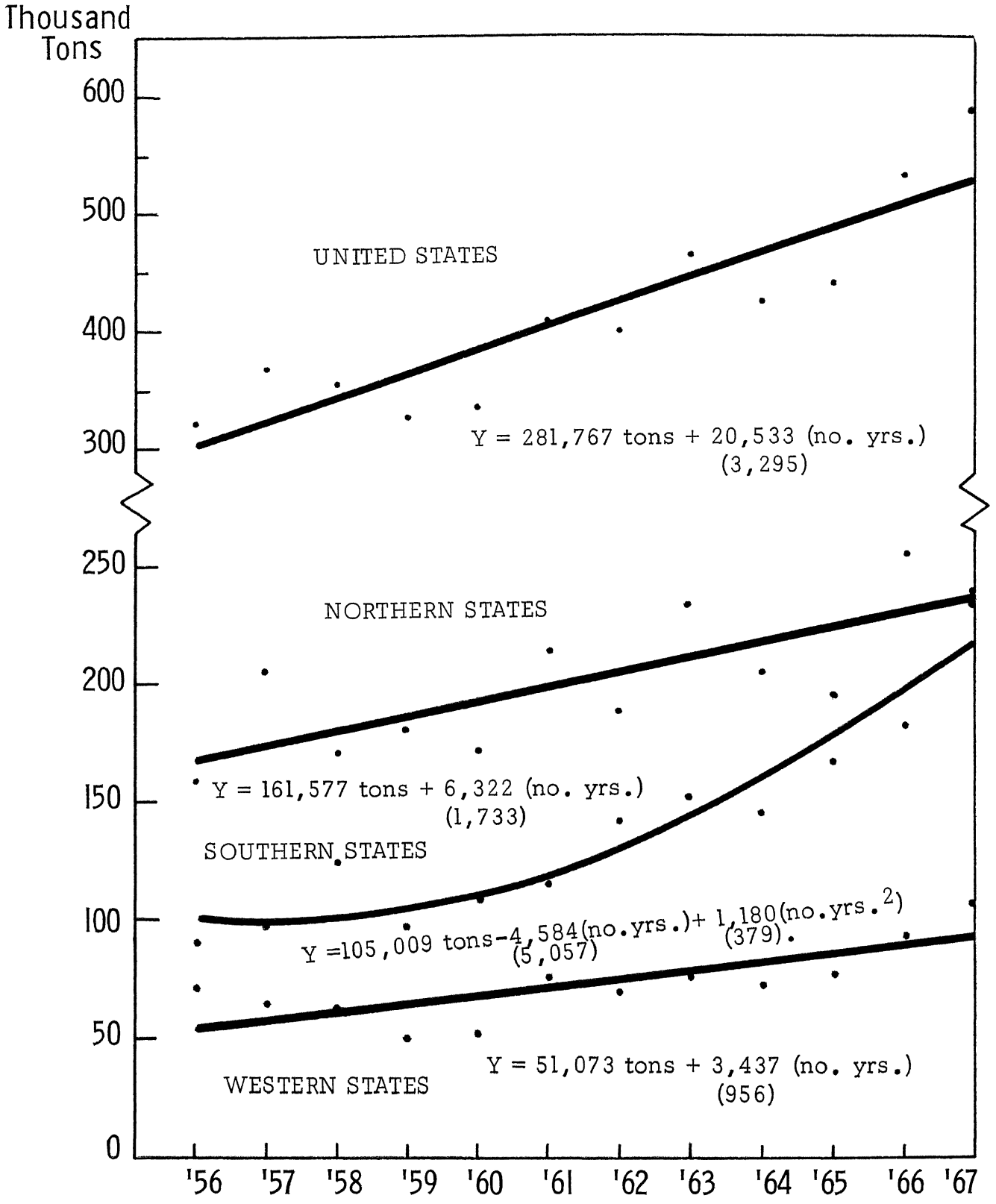
Source: U. S. Food Consumption. June 1965. U. S. Department of Agriculture, Economic Research Service, Bulletin 364; and Statistical Abstract of the United States, 1967.

FIG. 2.—Estimated U. S. Consumption of Pickles, Product Weight Basis, 1956-1967.



Source: U. S. Food Consumption. June 1965. U. S. Department of Agriculture, Economic Research Service, Bulletin 364; and Statistical Abstract of the United States, 1967.

FIG. 3.—Cucumbers Harvested for Pickles by Regions and the United States, 1956-1967.



Source: Vegetables for Processing. U. S. Department of Agriculture, Statistical Reporting Service, Bulletins 299, 411, and VG 3-2 (67).

for the United States in Figure 3. The 1967 harvest, 589,640 tons, was nearly 83 percent greater than that of 1956, the lowest in the most recent 12-year period. Similar upward trends in harvests are shown in Figure 3 for the three sub-regions considered—the 21 northern states, 16 southern states, and 11 western states.[6]

Of the three regions studied, the 16 southern states have experienced the most rapid expansion in production of cucumbers for pickles. Production in the south is expanding at an increasing rate (Figure 3). Although the 21 northern states have historically produced the largest share of the total U. S. production, if the cyclical pattern of production in the 21 northern states and the recent expansion trend in the south both continue, the 16 southern states will surpass the other regions in the next 5 years.

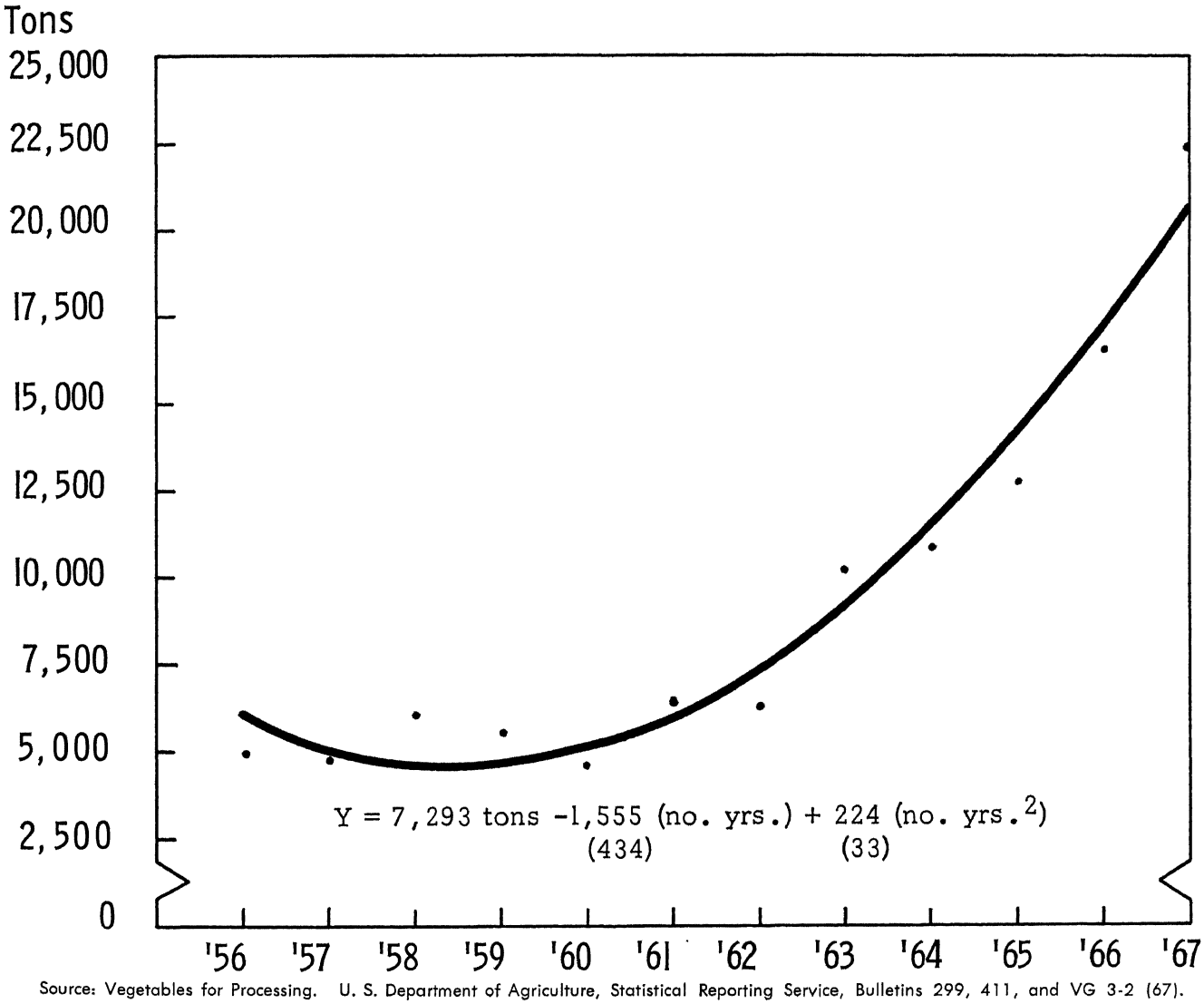
The 11 western states have also expanded production of cucumbers for pickles in the recent 12-year period. However, the rate of expansion in the western states is the most modest of the three regions.

Ohio's rate of expansion of production of cucumbers harvested for pickles is increasing more rapidly than that of any of the 21 northern states. This can be seen from an analysis of the data in Table 6 and Figure 4.

Ohio farmers harvested 4,900 tons of cucumbers for pickles in 1956, 3 percent of the total tonnage harvested in the 21 northern states. By 1967, Ohio

[6]Northern states—Connecticut, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, South Dakota, Vermont, and Wisconsin.
Southern states—Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.
Western states—Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

FIG. 4.—Cucumbers Harvested for Pickles, Ohio, 1956-1967.



Source: Vegetables for Processing. U. S. Department of Agriculture, Statistical Reporting Service, Bulletins 299, 411, and VG 3-2 (67).

TABLE 6.—Comparative Production Data, Cucumbers Harvested for Pickles, Ohio and Selected Northern States, 1956 and 1957.

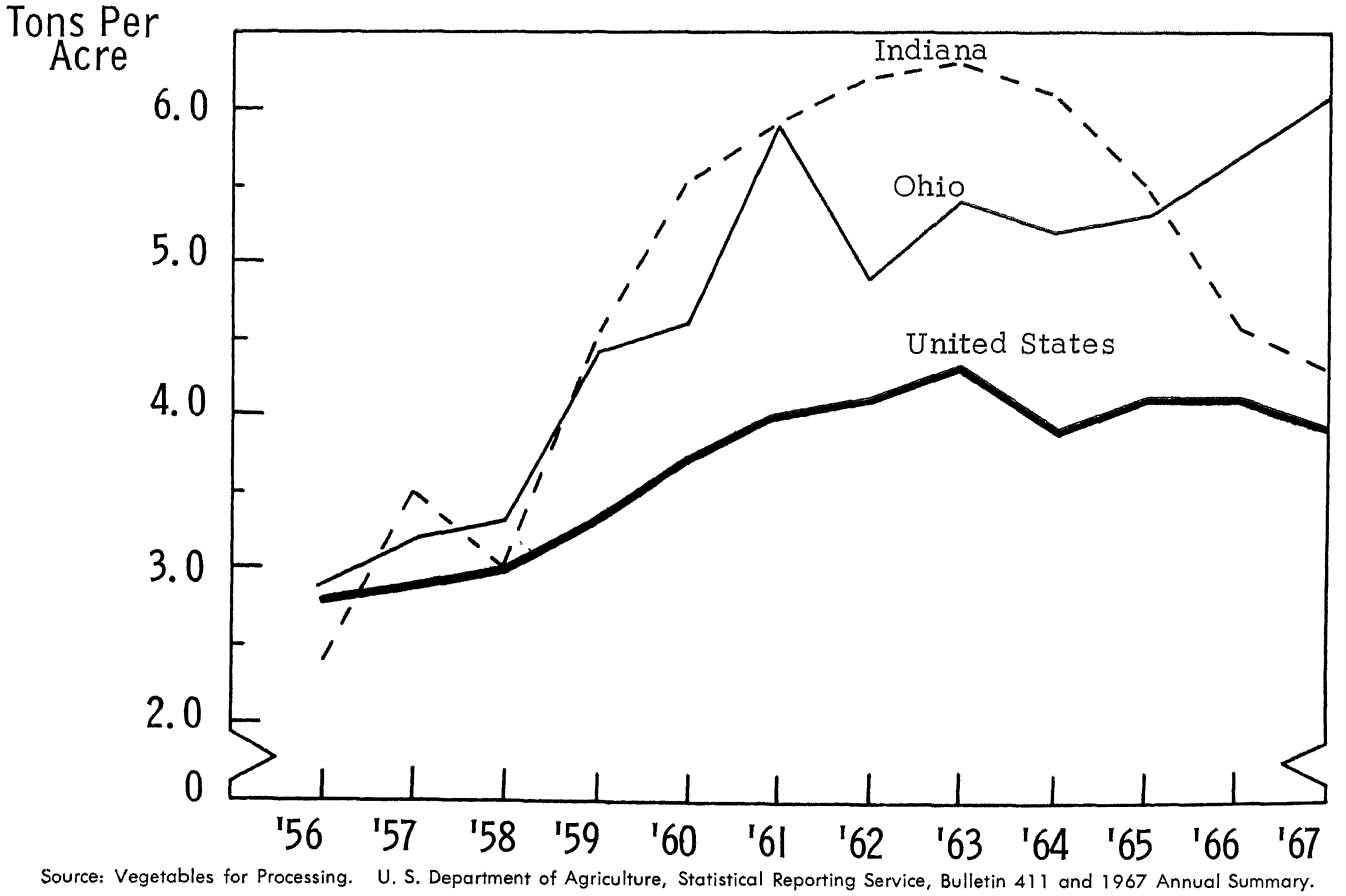
	Cucumbers Harvested for Pickles								
	Acres Harvested			Production			Value		
	1956	1967	Percent Change	1956	1967	Percent Change	1956	1967	Percent Change
	Acres	Acres		Tons	Tons		$1,000	$1,000	
Ohio	1,700	3,700	+117.6	4,900	22,500	+359.2	337	2,408	+614.5
Indiana	2,000	2,200	+ 10.0	4,800	9,550	+ 99.0	230	825	+258.7
Michigan	35,800	25,300	— 29.3	91,080	117,640	+ 29.2	4,744	13,176	+177.8
Wisconsin	17,500	17,100	— 2.3	42,000	34,200	— 18.6	2,450	3,420	+ 39.6
21 Northern States	63,130	58,140	— 7.9	159,390	240,740	+ 51.0	8,883	24,447	+175.2

*Source: Vegetables for Processing. U.S. Dept. of Agriculture, Statistical Reporting Service, Bulls. 299, 411, and VG 3-2 (67).

farmers had increased production to 22,500 tons, 9.3 percent of the total in the region. During the period, Ohio producers increased cucumber acreage harvested for pickles 118 percent or 2,000 acres but the total production increase of 17,600 tons represented a 359 percent increase over the base year. Ohio production has been expanding at the rate of more than 4,000 tons per year for the past several years.

Michigan has the largest acreage and production of cucumbers harvested for pickles of any of the 21 northern states. Its production of 91,080 tons in 1956 represented 57 percent of the total tonnage in

FIG. 5.—Comparative Yields per Acre of Cucumbers Harvested for Pickles, Ohio, Indiana, and United States, 1956-1967.



Source: Vegetables for Processing. U. S. Department of Agriculture, Statistical Reporting Service, Bulletin 411 and 1967 Annual Summary.

the northern states that year. In 1967, Michigan's production had increased to 117,640 tons but this volume represented only 49 percent of the total tonnage.

An analysis of the data in Table 6 also shows that both Michigan and Wisconsin reduced the acreage planted to cucumbers for pickles during the 12-year period, the former by 29.3 percent and the latter by 2.3 percent. However, the increased yields in Michigan offset the reduction in acreage, since total production increased 29.2 percent during the period.

Wisconsin experienced both a decline in acreage planted and total production. Indiana's experience was more like Ohio's in that acreage and total production both increased, although at a much smaller rate.

Ohio also recorded the largest percentage increase (614 percent) in total value of cucumbers harvested for pickles of the four states during the period. The farm value of Ohio's pickle crop in 1956 was approximately $337,000 but by 1967 it had increased to $2,408,000.

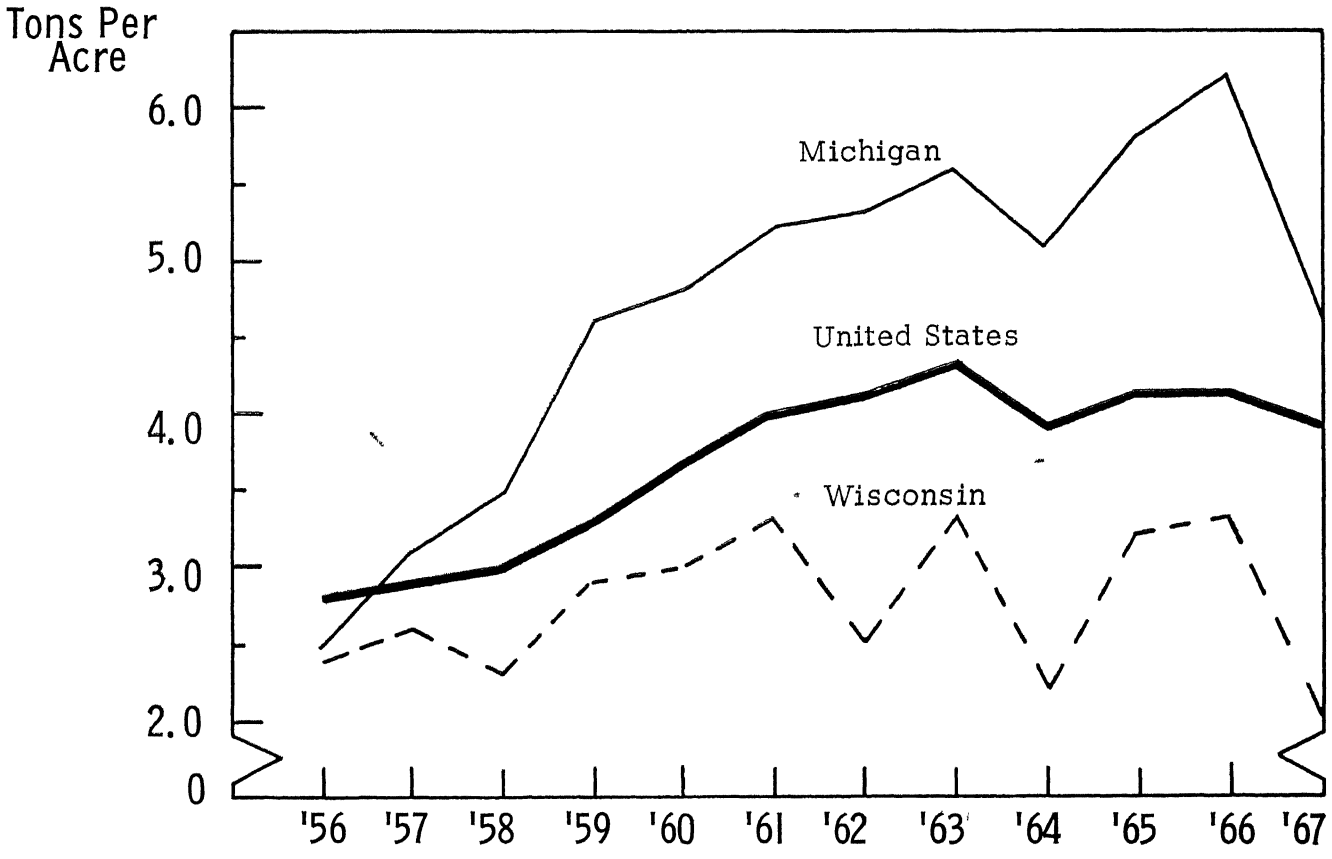
Two other indicators substantiate this positive growth characteristic and will be discussed only briefly. These are: yields per acre and value per ton. The data relative to comparative yields of cucumbers harvested for pickles are presented in Figures 5 and 6.

Ohio growers had the highest average yield of cucumbers harvested per acre of the states compared in 1967, 6.1 tons. This is more than double the yield of 2.9 tons per acre recorded on the average in Ohio for the 1956 harvest season. Ohio was also the only state of those compared which did not experience a decrease in yield during the 1967 harvest season.

Wisconsin was the only one of the four North Central states compared where yields were less than the U. S. average yield for all 12 years studied. Indiana's average yield per acre reached a peak in 1963 but has been declining since that year. Yields per acre in Ohio and Michigan show a decided upward trend which is greater than that for the United States. Changes in yield per acre in Wisconsin have been very erratic. Average yield in 1967 was less than that in 1956.

Data regarding farm value per ton of cucumbers harvested for pickles are shown in Figures 7 and 8. A fairly steady average market price per ton paid in the four states and in the United States was evident

FIG. 6.—Comparative Yields per Acre of Cucumbers Harvested for Pickles, Michigan, Wisconsin, and United States, 1956-1967.



Source: Vegetables for Processing. U. S. Department of Agriculture, Statistical Reporting Service, Bulletin 411 and 1967 Annual Summary.

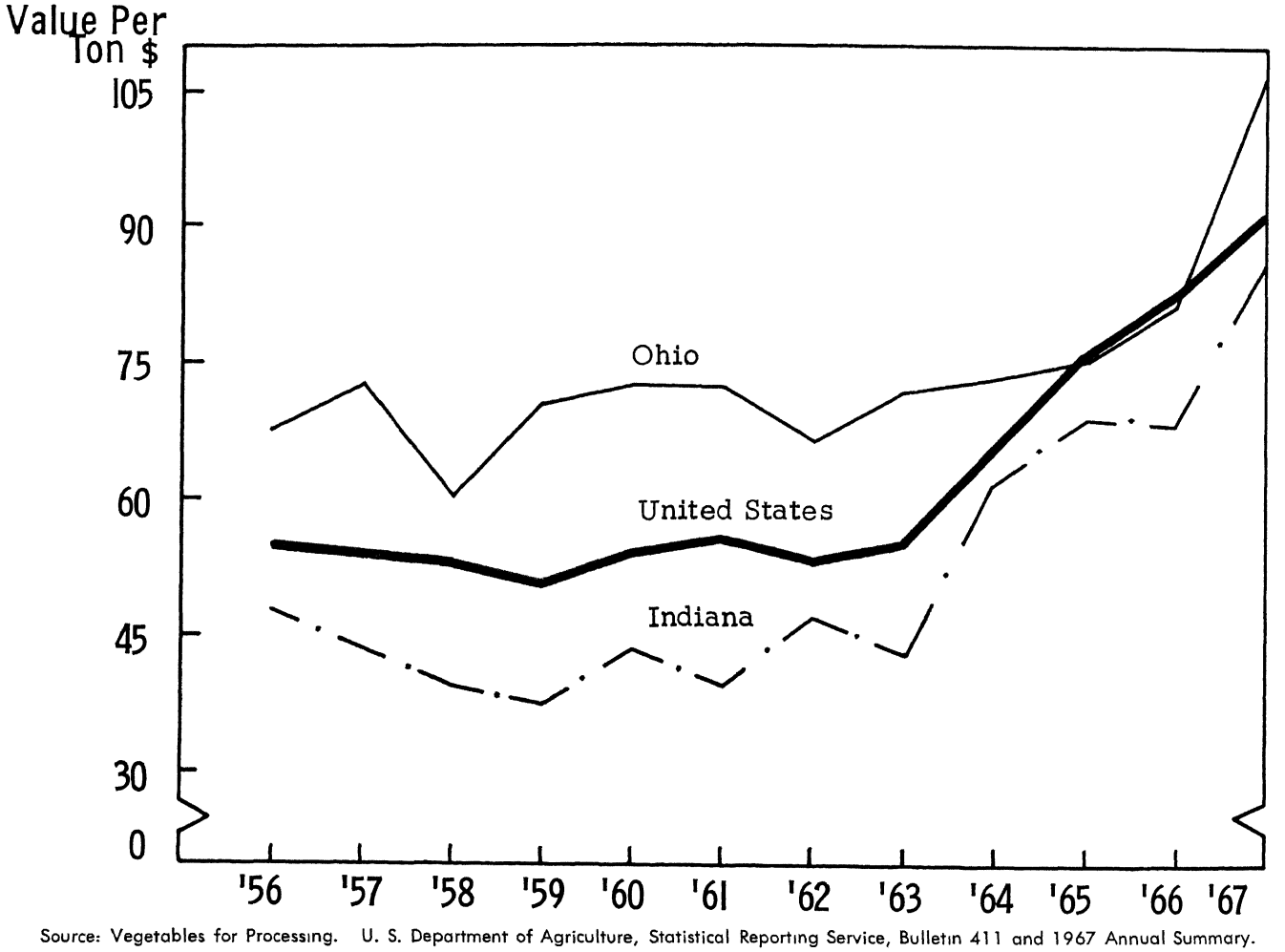
for the years 1956 through 1963. Beginning in 1964, however, a marked increase in prices paid per ton is seen in all states and for the United States so that 1967 prices paid were the highest in the 12-year period. This may be considered further substantiation of the growth pattern in the industry as demonstrated earlier in total and per capita consumption data and in production responses.

Production Costs and Returns: Some pertinent questions might be raised at this point regarding the economic factors underlying the expansion of Ohio's production of cucumbers for pickles. How profitable is the production of cucumbers? What are the costs and returns for this crop compared with others which compete for the resources used? While a detailed analysis of these factors is not relevant to this report, some recent work completed at the Ohio Agricultural Research and Development Center and The Ohio State University provides insights into this important area (6). These results will be reported in brief.

Doster (6) utilized the budgetary approach and linear programming models, incorporating several assumptions about the use of several new technologies not in common practice in Ohio, to estimate net income possibilities from the production of selected vegetable crops in competition with prevailing corn and soybean enterprises. Assuming that irrigation and mechanical harvesting would be utilized and that a skilled operator's time available for the crucial planting period would be the major restriction, costs and returns were estimated for ten vegetables using current market prices for both outputs and inputs. These were compared with similar data for corn and soybeans, using the best practices known for these crops.

Assuming a yield of 5.6 tons of cucumbers per acre and a value of $107 per ton, the net income possibility per acre was $443. This was only exceeded by the net incomes estimated for peppers and asparagus. The use of mechanical harvesting, not yet common in Ohio, added materially to this high net in-

FIG. 7.—Value per Ton of Cucumbers Harvested for Pickles, Ohio, Indiana, and United States, 1956-1967.



Source: Vegetables for Processing. U. S. Department of Agriculture, Statistical Reporting Service, Bulletin 411 and 1967 Annual Summary.

come result. The estimated net income using hand labor for harvesting was $143 per acre. This was obtained by deducting from the $600 gross revenue the estimated cost of $300 per acre for harvest labor and $157 for all other costs, including irrigation. This is still a very profitable enterprise compared with irrigated field corn ($70 net income per acre) and irrigated soybeans ($66 net income per acre). It accounts in part for the rapid expansion of both acreage and total production of cucumbers for pickles in Ohio.

These relationships presuppose a ready market in the form of buyers, with excess or expanding plant capacity, steady or increasing market price, and favorable contract terms offered to growers. All of these have existed in Ohio for the past several years.

Tomatoes for Processing

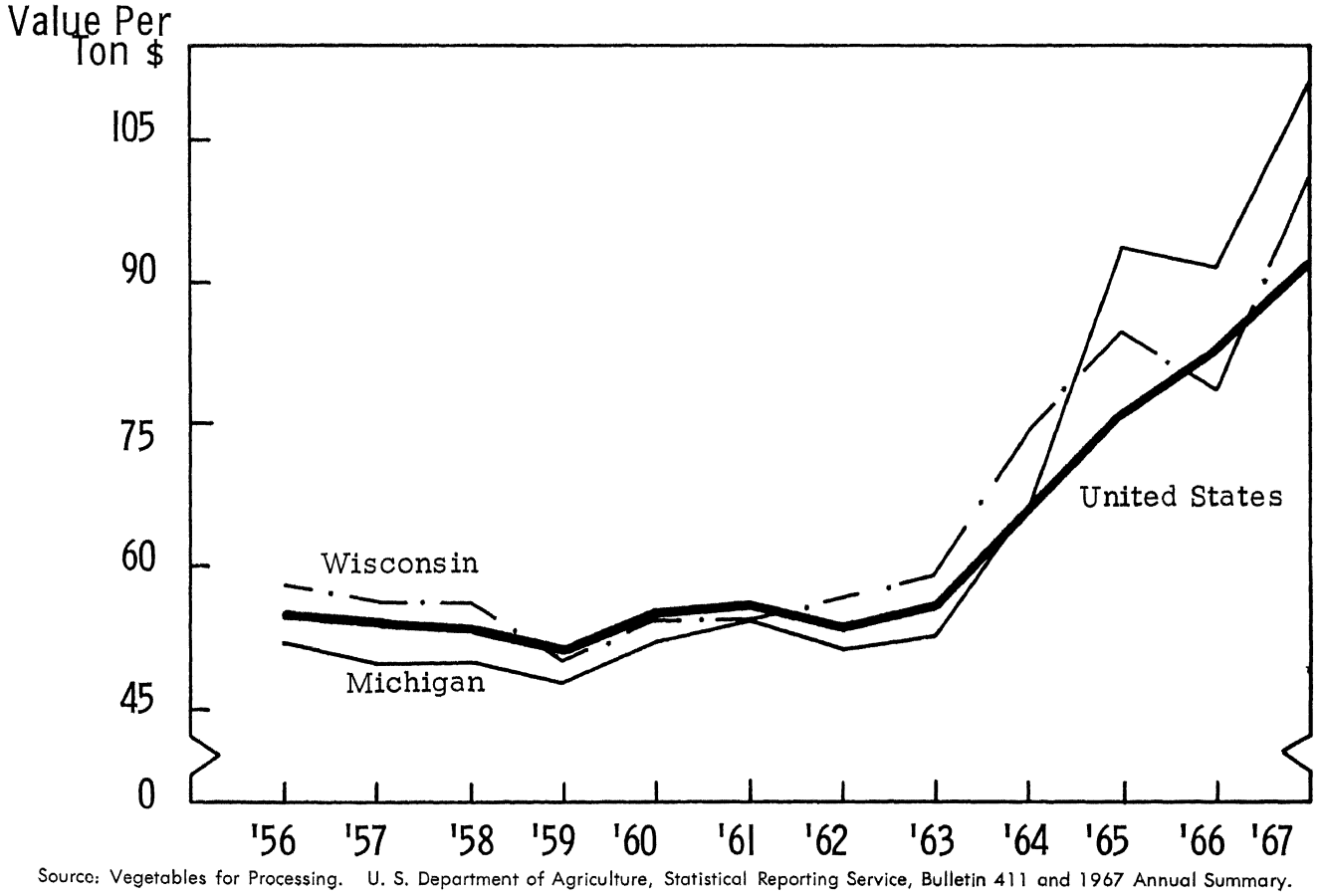
Consumption: Total consumption of processed tomato products, excluding soups, continues to increase at a significant rate in the United States. The 12-year trend shown in Figure 9 is based on the actual per capita consumption data for the years 1956 through 1965 multiplied by U. S. population data and projected for the years 1966 and 1967.[7] The difference in estimated total consumption for 1956, 1.40 million tons, and that for 1967, 1.93 million tons, is 530,000 tons. Total consumption is increasing at an average yearly rate of 47,994 tons in the United States.

The major factors of importance in this growth are increasing per capita consumption and an expanding total population. Total consumption of catsup is increasing at a faster rate than any other processed tomato products studied. An analysis of the data in Figures 10 and 11 shows that total consumption of catsup has increased at an average rate of 23,258 tons per year in the United States during the 12-year period. Consequently, total estimated consumption in 1967 of 510,337 tons was twice that of 1956.

The per capita consumption data presented in Table 7 substantiates the increasing importance of

[7]All consumption data discussed below are based on a finished product weight basis as reported by the U. S. Department of Agriculture. The reader must apply appropriate processing yield conversion data to the total consumption figures if relevant raw stock equivalent data are desired.

FIG. 8.—Value per Ton of Cucumbers Harvested for Pickles, Michigan, Wisconsin, and United States, 1956-1967.

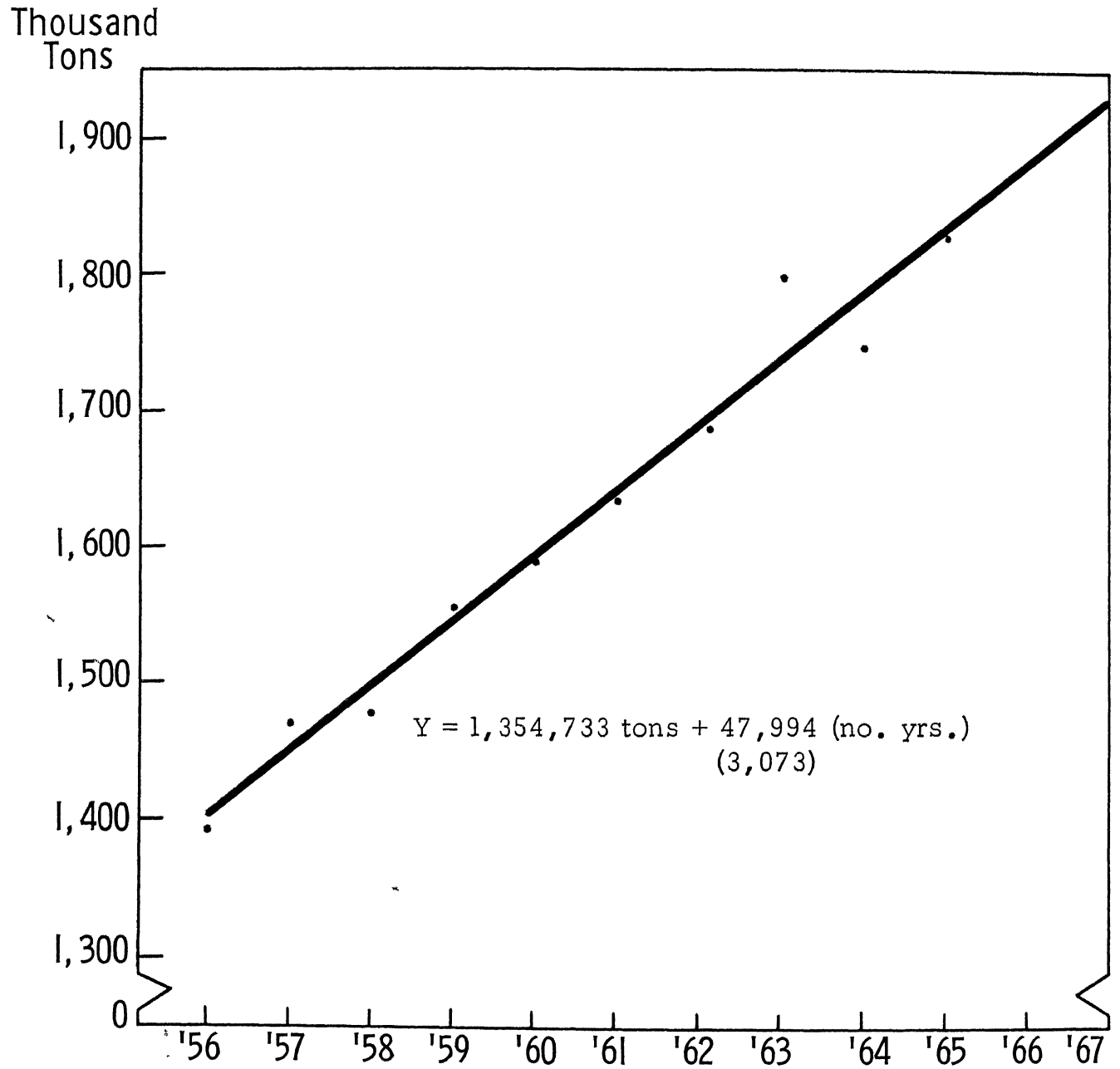


Source: Vegetables for Processing. U. S. Department of Agriculture, Statistical Reporting Service, Bulletin 411 and 1967 Annual Summary.

catsup. It will be noted that the estimated per capita consumption of catsup in 1967 of 5.1 lb. per year represented a 64.5 percent increase above the 1956 amount of 3.1 lb. per person. The average increase in per capita consumption of catsup per person per year during the 12-year period is nearly 0.2 lb. The fact that more people are eating away from home and are eating more foods like hamburgers, hot dogs, french fried potatoes, and onion rings has undoubtedly contributed to this trend.

The total consumption of tomato paste has also increased since 1956. The estimated total of 416,759 tons in 1967 was 51 percent more than that consumed in 1956. Estimated per capita consumption of 4.2 lb. per year in 1967 was 27.3 percent greater than the 3.3 lb. recorded 12 years earlier in 1956. Similar to the situation for catsup, although increasing at about half the rate, the estimated annual increase in total consumption of tomato paste in the United States has been 12,839 tons.

FIG. 9.—Estimated U. S. Consumption of Processed Tomato Products (Excluding Soups), Product Weight Basis, 1956-1967.

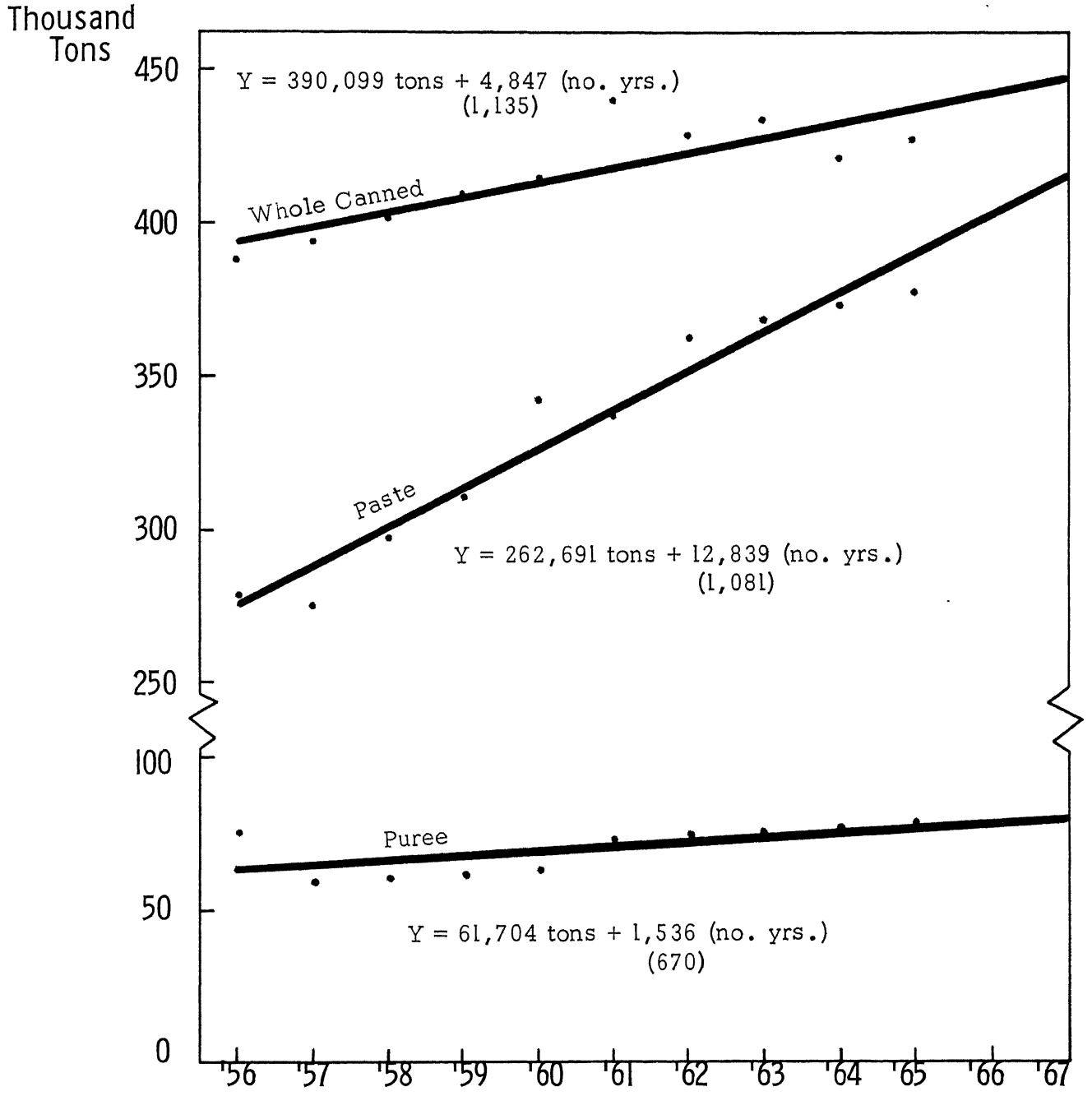


Source: U. S. Food Consumption. June 1965. U. S. Department of Agriculture, Economic Research Service, Bulletin 364; and Statistical Abstract of the United States, 1967.

The situation for tomato juice is mixed. The trend for the 12-year period is dampened by erratic changes in per capita and total consumption in 1957-58, 1959-60, and 1963-64. The first year in each of these 2-year periods was one of significantly increased consumption. This was then followed by a year of much lower than average consumption. One explanation may be that tomato juice and concentrated and frozen citrus juices are substitutes, since the 3 peak years of tomato juice consumption followed years of disastrous freezes in specific concentrated citrus production regions.

Despite the erratic swings in total and per capita consumption, tomato juice is a significant part of the tomato product consumption situation. Total estimated consumption of 475,437 tons in 1967 repre-

FIG. 10.—Estimated U. S. Consumption of Processed Tomato Products (Excluding Soups), Product Weight Basis, 1956-1967.



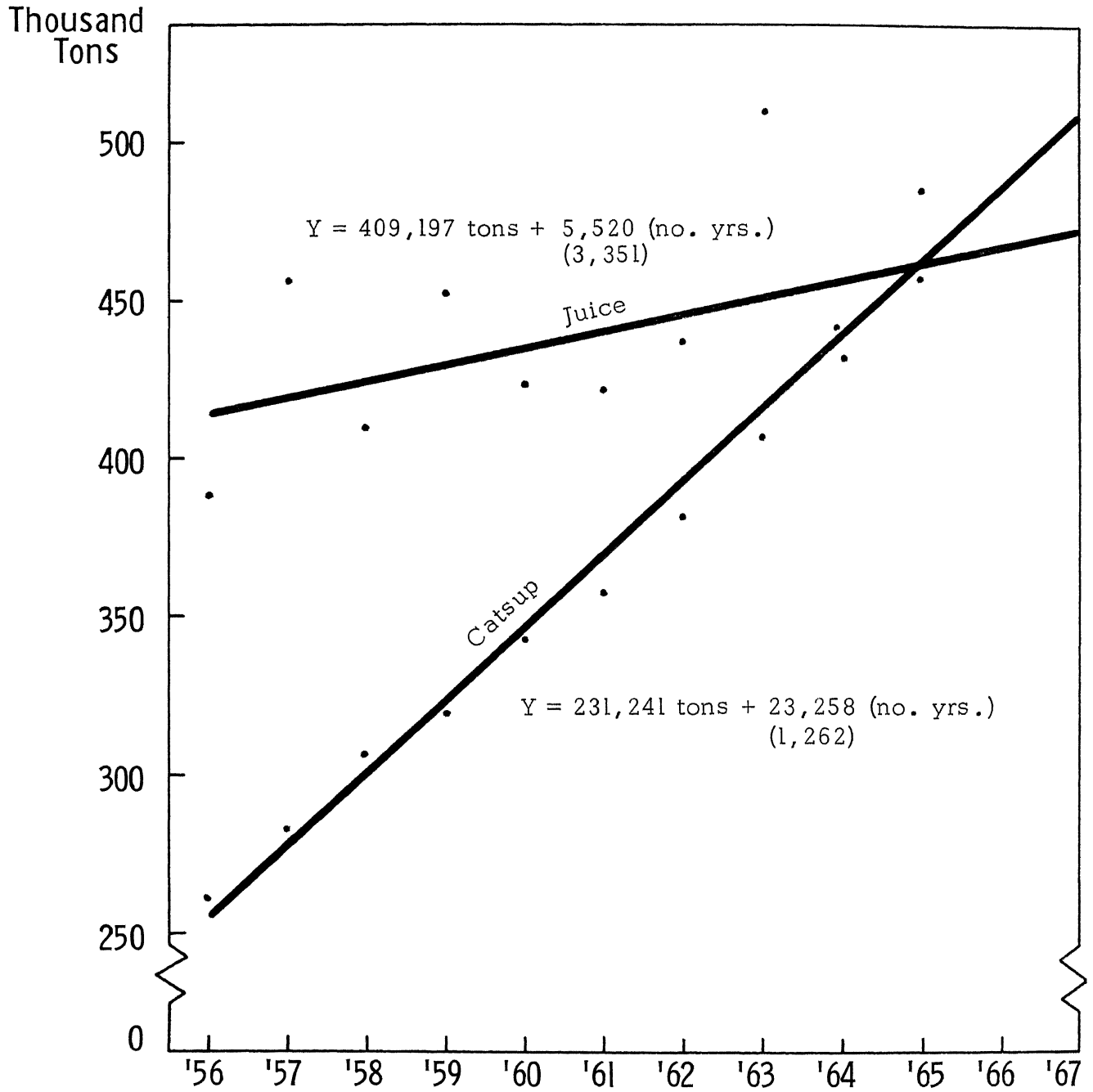
Source: U. S. Food Consumption. June 1965. U. S. Department of Agriculture, Economic Research Service, Bulletin 364; and Statistical Abstract of the United States, 1967.

sented approximately 25 percent of total consumption of the five products studied. Tomato juice was second only to catsup in order of importance.

The per capita consumption of whole canned tomatoes is decreasing, as is consumption of tomato puree. Total consumption of the former was estimated to be 448,263 tons in 1967. This represented an average annual increase of 4,847 tons during the 12-year period but this is accounted for by increasing population. Per capita consumption was down 2.2 percent during the same period.

Total consumption of tomato puree is fairly stable at 80,136 tons per year and per capita consumption declined slightly during the period. Total consumption of tomato puree represents the smallest part of the aggregate consumption of processed tomato products, 4.2 percent.

FIG. 11.—Estimated U. S. Consumption of Processed Tomato Products (Excluding Soups), Product Weight Basis, 1956-1967.



Source: U. S. Food Consumption. June 1965. U. S. Department of Agriculture, Economic Research Service, Bulletin 364; and Statistical Abstract of the United States, 1967.

TABLE 7.—U. S. Per Capita Consumption of Processed Tomato Products, Product Weight Basis, 1956-67.*

Product	Per Capita Consumption				
	1956	1961	1967†	Change 1956-67	Average Change per Year 1956-67
	Lb.	Lb.	Lb.	Percent	Lb.
Catsup	3.1	3.9	5.1	+64.5	+.18
Paste	3.3	3.7	4.2	+27.3	+.08
Juice	4.6	4.6	4.7	+ 2.2	+.01
Puree	.9	.8	.8	−11.1	−.01
Whole	4.6	4.8	4.5	− 2.2	−.01
All Products	16.5	17.8	19.3	+17.0	+.25

*Source: United States Food Consumption. U.S.Dept. of Agriculture, Economic Research Service, Bull. 364 and Supplement, June 1965.
†Projected to 1967 from 10-year linear trends.

Production: Trends in the production of tomatoes harvested for processing have been thoroughly discussed by Connolly and Cravens in their recent research bulletin (5). However, the availability of some additional research information makes it feasible to update some data they presented.

The average annual rate of change in the production of tomatoes harvested for processing in Ohio is increasing. Connolly and Cravens reported an average annual increase of 13,600 tons for the period 1954-1965. The average annual increase for the 12-year period 1956-67 was 26,568 tons (Figure 12). Total production on Ohio farms in 1967 was 541,300 tons compared to 225,700 tons in 1956. This difference of 315,600 tons during the 12-year period represents an aggregate increase of 150.5 percent or more than 12.5 percent per year on the average.

The industry shows a growth pattern nationwide, too. Figure 12 shows that the average annual increase in production of tomatoes harvested for processing in the United States was 89,990 tons for the 12-year period. The national growth is not as rapid as that of Ohio since the total base is much larger, averaging 4,372,010 tons during the period of study. U. S. production also was much more erratic than Ohio production, as can be readily seen from the data in Figure 12. The rate of increase in production nationwide for the 12-year period was 11.3 percent or slightly more than 0.9 percent per year on the average.

The fact of greatest significance is that Ohio's average annual aggregate growth of 26,568 tons during the 12-year period was nearly 30 percent of the average annual aggregate growth of 89,990 tons for the United States. Connolly and Cravens (5) noted that Ohio produced 11.8 percent of the U. S. supply of processing tomatoes in 1965, 8.1 percent on the average between 1960-64 and 5.7 percent between 1950-59. The figures for 1966 and 1967 were 8.5 percent and 10.5 percent, giving further evidence of Ohio's recent growth despite normal year-to-year variations.

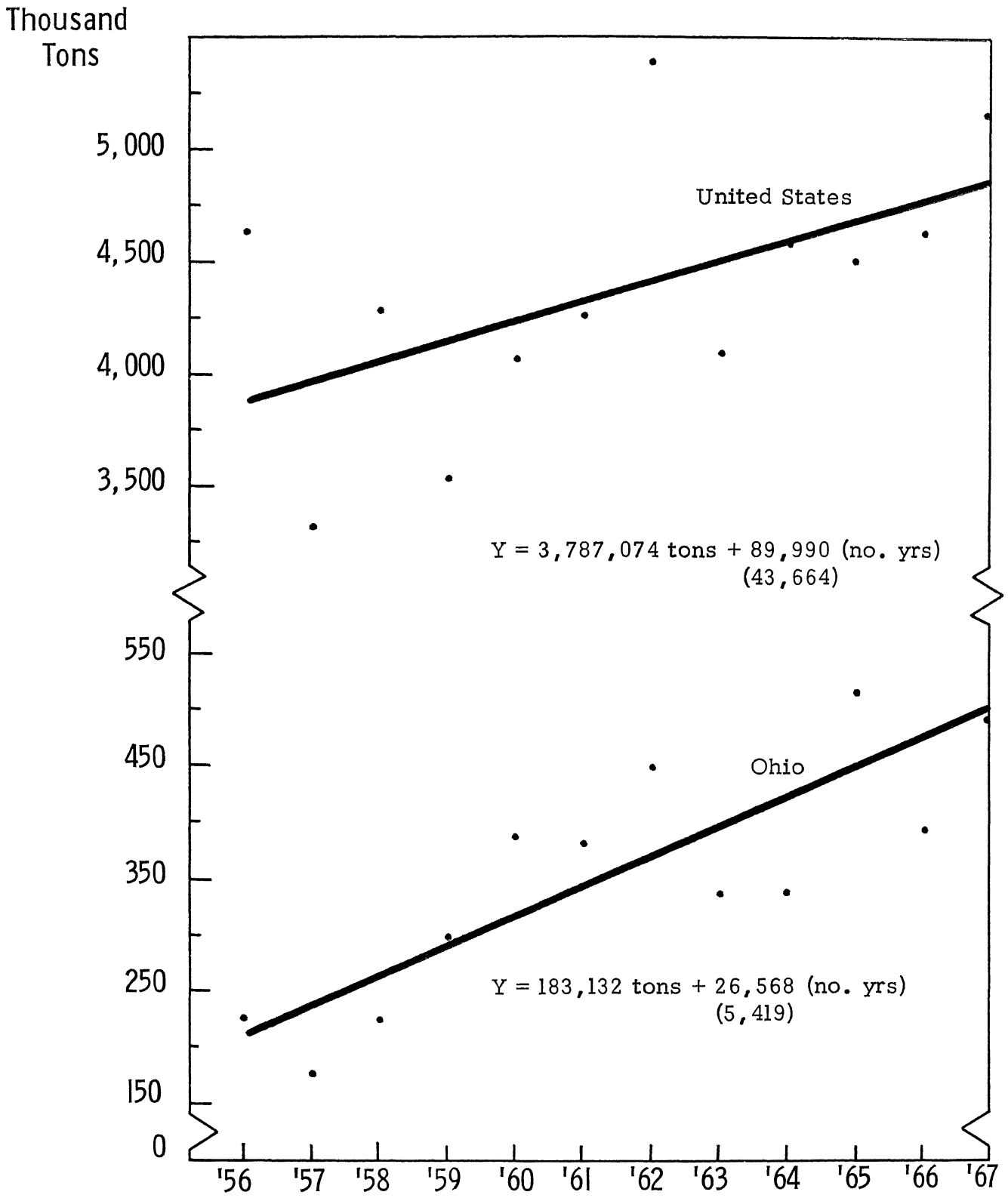
Connolly and Cravens also pointed out clearly that California is by far the largest state supplying tomatoes for processing. For example, in 1965 California supplied 56.8 percent of the United States total. Ohio continues to rank second, followed by New Jersey with 7.6 percent of the total and Indiana with 6.0 percent. However, Ohio has experienced a very fast rate of growth in average yield per acre.

During the 12-year period 1954-65, the average annual rate of yield increase for the United States was 0.72 tons per acre. For this same period, Ohio's average annual rate of increase in yield was 0.99 tons per acre. This rate is almost three times as great as that of California. Only two states, New Jersey (1.13 tons per acre) and Delaware (1.07 tons per acre), have had greater increases in yields during the period than Ohio (5).

California led all states in average yield per acre in the 1954-65 period with 17.53 tons. Ohio was a close second with 14.89 tons. Final data for 1967 show Ohio's average yield increased to 19.13 tons per acre while that of California was 16.99 tons. Average for the United States was 15.49 tons.

Production Costs and Returns: Referring again to the work of Doster and the assumptions specified, growth in tomato production for processing in Ohio would be expected to continue, based on the costs and returns compared with those for the traditional soybean and corn enterprises. Net returns for tomatoes averaged $296 per acre compared with $70 for irrigated corn and $66 for early irrigated soybeans.

FIG. 12.—Tomatoes Harvested for Processing, Ohio and the United States, 1956-1967.



Source: Vegetables for Processing. U. S. Department of Agriculture, Statistical Reporting Service, Bulletin 411 and 1967 Annual Summary.

The $296 assumed mechanical harvesting of tomatoes, which is only a recent innovation in Ohio and is not common. The rate charged for this activity was $200 per acre. The reader should increase or decrease this charge for hand harvesting or mechanical harvesting, based on his own experience and costs. Total revenue was estimated at $700 per acre (20 tons per acre at $35 per ton). Therefore, total costs per acre, other than harvesting, equaled $204, leaving a net income of $296 per acre.

IMPLICATIONS

The data and discussion in the preceding sections point up clearly the growth pattern of Ohio's canned and frozen foods processing industry. Rapid growth is evident in all three sectors—production, processing, and consumption. This has important implications for the economy of the state and the region.

Unfortunately, not enough is known about the specifics of these growth patterns. Rapidly expanding industries always experience growth problems. Many of these problems are technological and all of them have economic implications.

Several key problem areas which will require the cooperation and collaboration of farmers, processors, scientists, educators, and others concerned with the health and vitality of Ohio's agribusiness complex are:

- What are the salient components which give Ohio and the North Central states an economic comparative advantage over other regions in the production, processing, and distribution of selected vegetables? Markets? Capital? Climate? What components tend to result in comparative disadvantages?
- What are the economic consequences of certain technological shocks being experienced by all segments of the vegetable processing industry? Here one could list a large number of dynamic changes now or soon to be taking place: mechanical planting, thinning, and harvesting; new varieties; new chemical controls; new processing methods; new storage methods; new transportation and materials handling methods.
- What are the short-run, intermediate, and long-run implications of shifting demand relationships? What influence will changing patterns of living, population, and eating habits have on demand for the products of the industry?
- What are the patterns of change in market structure as production and processing become more specialized?
- Will international trade changes occur in both the supply and demand sectors which will significantly influence industry patterns?

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North Central Branch, Vickery, Erie County: 335 acres

Northwestern Branch, Hoytville, Wood County: 247 acres

Southeastern Branch, Carpenter, Meigs County: 330 acres

Southern Branch, Ripley, Brown County: 275 acres

Vegetable Crops Branch, Marietta, Washington County: 20 acres

Western Branch, South Charleston, Clark County: 428 acres